UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **5090/21**

Paper 2 Theory **May/June 2013**

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Section B
Answer **both** questions in this section.
Write your answers in the spaces provided on the Question Paper.

Section C
Answer **either** question 8 **or** question 9.
Write your answers in the spaces provided on the Question Paper.

You are advised to spend no longer than one hour on Section A.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

Electronic calculators may be used.

Section A

For Examiner's Use

Answer **all** the questions in this section.

Write your answers in the spaces provided.

1 **(a)** Table 1.1 lists the daily requirements for some of the components in the diet of a young child.

Table 1.1

diet component	daily requirement
energy	8 MJ
fat	50 g
protein	19 g
vitamin C	25 mg
vitamin D	0.005 mg
calcium	800 mg
iron	10 mg

State **two** components, other than those in Table 1.1, that are required in a balanced diet.

1. .....

2. .....

[2]

(b) Malnutrition is common in countries where there is famine.

List **two** problems that may contribute to famine.

1. .....

2. .....

[2]

(c) Fig. 1.1 shows the label from the packet of a type of food sometimes fed to young children suffering from severe malnutrition.

For Examiner's Use

Emergency Famine Food

92 g pack (provides 2.0 MJ)

Ready to use – does not require water or refrigeration

Contains: peanut paste, vegetable oil, powdered milk, powdered sugar, vitamins (including C and D), minerals (including iron and calcium)

Date of manufacture: June 2012 *Use within 2 years*

Fig. 1.1

(i) State **three** effects of malnutrition which may occur in young children.

1. .....

2. .....

3. .....

[3]

(ii) Explain how this emergency famine food helps to overcome the effects of malnutrition.

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.....[4]

[Total: 11]

2 **(a)** Receptors receive stimuli and convert them into electrical impulses.

Fig. 2.1 shows the pathway taken by electrical impulses in a reflex action. Complete Fig. 2.1 by writing the name of the appropriate component on the dotted lines.

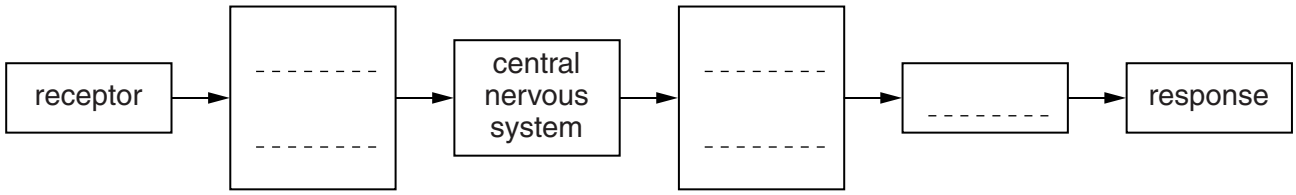

Fig. 2.1 [2]

(b) The brain is one part of the central nervous system. Fig. 2.2 is a diagram of the human brain.

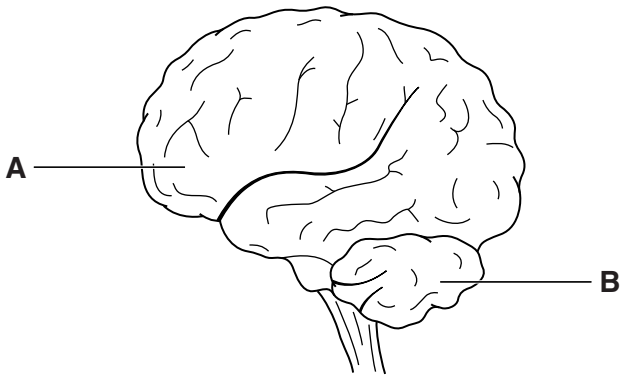

Fig. 2.2

Damage to the brain can sometimes occur as the result of an accident.

Name the parts of the brain labelled **A** and **B** in Fig. 2.2 and suggest a problem that may be experienced by a person who has damage to that part of the brain.

part **A** .....

problem caused by damage

.....

.....

part **B** .....

problem caused by damage

.....

.....

[4]

(c) Scientists are able to treat people with some types of brain damage. They may do this by injecting the patient with cells taken from another person (donor). These cells then travel to the brain where they divide and specialise to become groups of fully functioning brain cells.

For Examiner's Use

(i) State the type of cell division that takes place when the cells that have been injected reach the patient's brain.

.....[1]

(ii) State the term used to describe a group of cells that are specialised to perform a specific function.

.....[1]

(d) Female patients were injected with cells from male donors. After a period of time, the scientists examined brain cells from these patients and looked for groups of brain cells containing the Y chromosome.

Explain why finding groups of brain cells containing the Y chromosome would suggest to the scientists that the treatment may have been successful.

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.....[3]

[Total: 11]

For Examiner's Use

3 **(a)** Fig. 3.1 shows how pollination takes place in two different species of plant, species **P** and species **Q**.

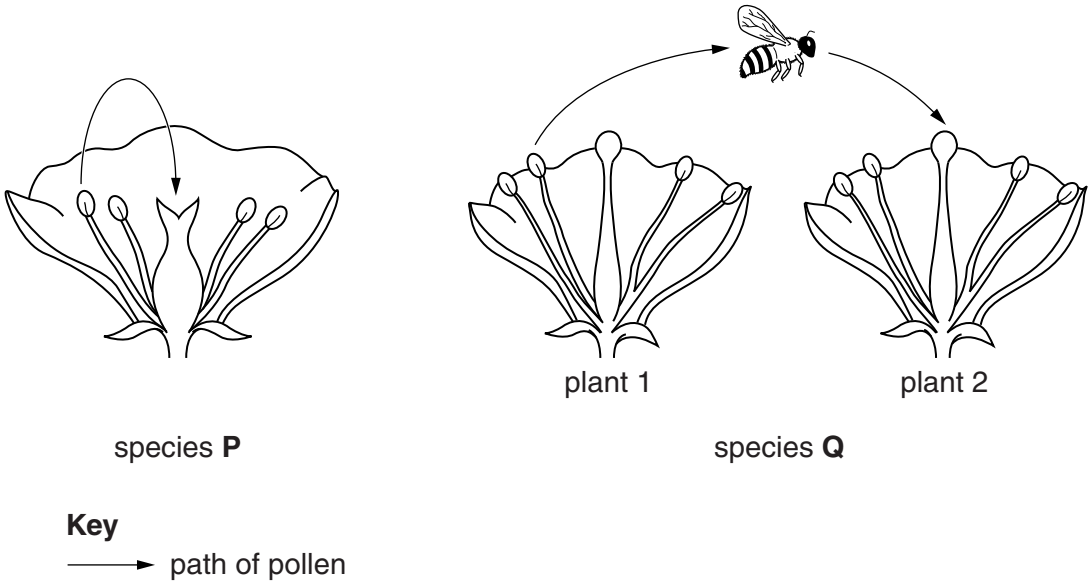

Fig. 3.1

(i) Using the information in Fig. 3.1, suggest and explain how each of these species of plant is pollinated.

species **P**

.....

.....

species **Q**

.....

.....

[4]

(ii) Suggest **two** ways in which a flower from a plant of species **Q** in Fig. 3.1 may be adapted to increase the likelihood of pollination taking place.

1. .....

2. .....

[2]

(b) State why species **Q** shows more variation in its phenotype than species **P**.

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.....[1]

(c) Describe the events that take place in a flower after pollination until fertilisation has taken place.

For Examiner's Use

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.....[3]

[Total: 10]

4 Fig. 4.1 shows the effect of increasing light intensity on photosynthesis in two different species of plants, species **C** and species **D**.

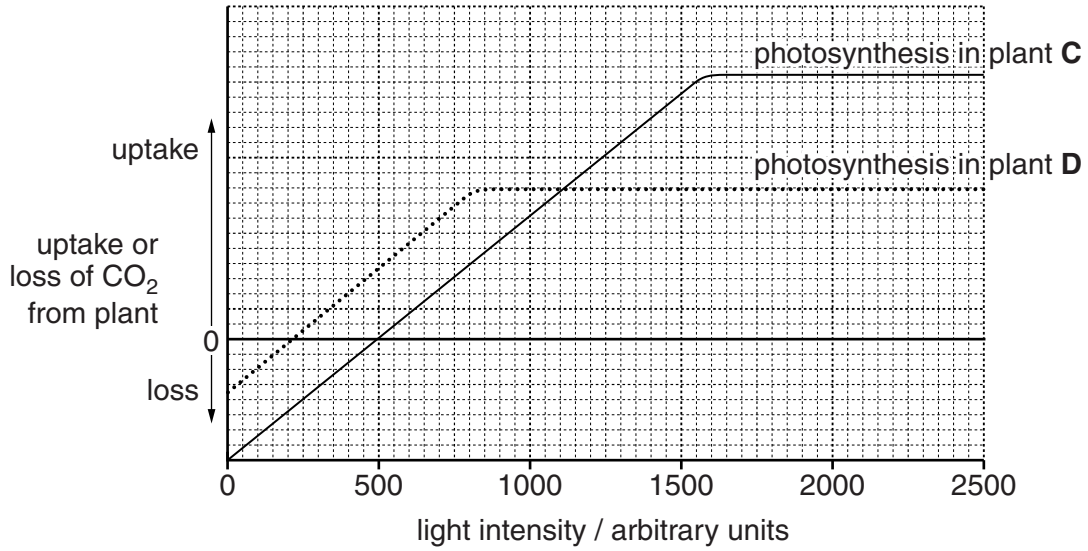

Fig. 4.1

(a) (i) Use Fig. 4.1 to find the light intensity at which the rate of respiration is equal to the rate of photosynthesis in plant **C**.

..... arbitrary units [1]

(ii) Explain why carbon dioxide is lost from plant **C** at a light intensity below the value you have stated in **(a)(i)**.

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.....[3]

(b) Using Fig. 4.1, suggest why plant species **D** is more likely than species **C** to grow on the ground in a wooded area such as a tropical rain forest.

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.....[3]

(c) When leaves fall from plants, they are decomposed to return nutrients to the soil.

Suggest why the rate of decomposition will be particularly high in a tropical rain forest.

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.....[3]

[Total: 10]

For Examiner's Use

5 **(a)** Define the term *gene*.

For Examiner's Use

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.....[2]

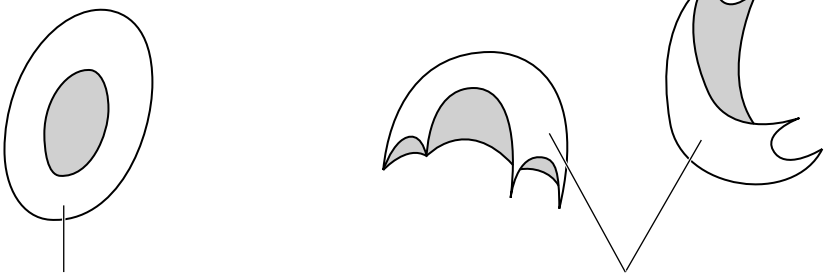
(b) A gene mutation occurs when part of the DNA on a single chromosome is changed. State **two** factors that may increase the rate of gene mutation.

1. .....

2. .....
[2]

(c) Sickle cell anaemia is caused by a gene mutation. Fig. 5.1 shows red blood cells from a healthy person and from a person with sickle cell anaemia.

For Examiner's Use



- biconcave shape
- elastic
- non-sticky
- lifespan of 120 days

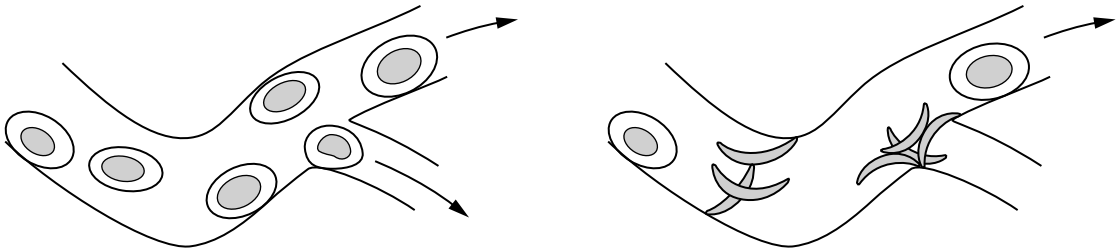
healthy person

- crescent shape
- non-elastic
- sticky
- lifespan of 10 to 20 days

person with sickle cell anaemia

Fig. 5.1

Fig. 5.2 shows the flow of red blood cells through a blood vessel in a healthy person and in a person with sickle cell anaemia.



healthy person

person with sickle cell anaemia

Fig. 5.2

Use information from Fig. 5.1 and Fig. 5.2 to suggest why the transport of oxygen to tissues is reduced in a person with sickle cell anaemia.

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.....[4]

[Total: 8]

[Turn over

Section B

For Examiner's Use

Answer **both** questions in this section.

Write your answers in the spaces provided.

6 **(a)** The menstrual cycle is controlled by several hormones including FSH and progesterone. Use your knowledge of the role of these hormones in the menstrual cycle to suggest explanations for each of the following.

(i) FSH is given during fertility treatment to women who experience problems becoming pregnant.

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.....[3]

(ii) Progesterone is a component of the contraceptive pill.

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.....[2]

(b) With reference to **named** substances, describe the functions of the placenta and the umbilical cord.

For Examiner's Use

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.....[5]

[Total: 10]

7 **(a)** Outline factors, other than alcohol, that may increase a person's risk of developing coronary heart disease.

For Examiner's Use

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.....[4]

(b) Describe the effects of excessive consumption of alcohol on the individual and society as a whole.

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[Total: 10]

Section C

For Examiner's Use

Answer **either** question 8 **or** question 9.

Write your answers in the spaces provided.

8 **(a)** Describe the function of the hepatic portal vein.

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.....[4]

(b) With reference to **named** molecules, describe the functions of the liver.

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.....[6]

[Total: 10]

For Examiner's Use

9 **(a)** Malaria is a disease caused by a parasite called *Plasmodium*. The mosquito is the vector of this parasite.

Define the terms *parasite* and *vector*.

parasite

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vector

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[4]

(b) Explain how the spread of malaria may be controlled. Refer to **both** *Plasmodium* and the mosquito in your answer.

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.....[6]

[Total: 10]